PART - A

Barcode No.1900100520

Do not write/Mark on Bar Code

HBSU Dr. Homi Bhabha State University, Mumbai

(Read the Instructions given on the reverse side)

Use Blue / Black Ball Pen only to darken the appropriate circles. Do not fold, tear, wrinkle, staple or use whitener on the cover page of the answer book. Do not write or mark on the barcode and the timing tracks.

CORRECT METHOD ●○○○ WRONG METHOD ⊘⊗●●

Supplement Booklet Information

Supplement Taken	Write the Supplement Barcode No.
Ⓨ ●	
If Yes, How Many Booklets ①②③④	

Confirm and Sign by Block Supervisor

Signature of Candidate

College Seal and Date

INSTITUTE OF SCIENCE MUMBAI

DEC 2019

Candidate Seat Number: 20192042 000999

Medium of Answer

1. English ●
2. Marathi ○
3. Other ○

PRN	2019001747
Candidate Seat No.	20192042

Q.P.Code	Subject Code (printed on Hallticket)
034123	031080

Signature & Name of the Block Supervisor with Date

12/12/19 Dr. K.S. Gadhave

Signature of Chief Coordinator

Exam Date	12 12 2019
Program Name	CHEMISTRY MSC-I
Program Code	Year: 2019 / Semester: I
Subject Name	Analytical chemistry.
Subject Code	031080

Part - B

Barcode No.1900100520

Do not write/Mark on Bar Code

Exam Date	: 12/12/2019
Program Code & Name	: 2019 - MSC-I.
Subject Code & Name	: 031080 Analytical.
Year / Semester	: 2019 - MSC-I.

If Physically challenged : LD ○ PC ○ VI ○ Regular ○

Question wise marks given by Examiner

Q. No.	Marks	Q. No.	Marks
1		6	
2		7	
3		8	
4		9	
5		10	
		Total	

Name and Signature of Examiner with Date

Question wise marks given by Moderator

Q. No.	Marks	Q. No.	Marks
1		6	
2		7	
3		8	
4		9	
5		10	
		Total	

Name and Signature of Moderator with Date

Sr. No. 1900014360

INSTRUCTIONS TO CANDIDATES

1. Candidates should occupy the correct seat and write correct seat number and other details in the space provided for the purpose on the answer-books.
2. Candidates who are not in their seats by the time notified, will not as a rule be permitted to appear for the examination. The Senior Supervisor may at his/her discretion admit those who give him/her a satisfactory reason.
3. Each answer-book contains forty pages. Check whether the pages are properly numbered.
4. Candidates should write their answers in legible handwriting. They are warned that zero marks may be assigned to answers which cannot be assessed by the examiners owing to illegible handwriting.
5. Write on both sides of a page. Rough work where necessary, should be done on the last page in the space provided. No page should be left blank. Any such act shall be treated as unfair means.
6. Do not write anything in the Examiner & Moderator sheet (Part-B) & Re-Evaluator Sheet except Candidate details.
7. Do not damage or make any stray marks on the barcodes.
8. Candidates will not be permitted to leave the examination hall until half an hour after the question paper is distributed.
9. All answer-books supplied shall be returned whether written or blank. Nothing shall be written on the question-paper.
10. No sheet shall be torn from the provided answer-books nor shall additional papers attached to them.
11. Even if it is mentioned in question paper to write each section in separate answer book, if any paper / subject have multiple sections, **the candidate has to write all sections in one and the same answer book.**
12. A warning bell will be given ten minutes before the close of the examination. Candidates will not be allowed to leave the examination hall during the last ten minutes. At the final bell, they must stop writing and be ready to hand over their answer books to the Junior Supervisor. They should not leave their seats until answer-books from all candidates are collected by the Junior Supervisor.

UNFAIR MEANS IN THE EXAMINATIONS

13. **Candidates shall write the answers only with BLUE/BLACK ink Ball pen only. Use of any other Pen like Gel ink or Fountain ink or any other colour ink, will be treated as unfair means in terms of revealing of identity.**
14. Candidates are **forbidden to (i) bring any book, notes, scribbling papers, pages, Mobile phones/smart watches or any other similar devices.** (ii) speak or communicate in any manner to any other candidate, while the examination is in progress, and (iii) take with them any answer-book written or blank while leaving the examination hall. The supervisors/authorized persons are authorized to check the students.
15. A candidate who disobeys any instructions issued by the Senior/ Junior Supervisor or who is guilty or rude or disobedient behavior is liable for disciplinary action to be taken against him / her by the University.
16. Do not fold the answer book anywhere because it will be treated as unfair means in terms of revealing of identity.
17. Candidates suspected to be guilty of any of the aforesaid acts will be allowed to write their paper only after giving an undertaking in writing that the decision of the University in respect of the reported act of unfair means is binding on them/Exchange of writing materials, stencils, mathematical instruments, etc. is strictly prohibited. If candidates want anything, they should approach the Junior Supervisor without disturbing other candidates. However, they should not leave their seats on any account..
18. Any method to bribe the examiner/s by attaching currency notes or letters is strictly prohibited and will result in serious action being taken by the University
19. Seat number should be written only the space provided for the same. Candidate should not write his/her name in any part of the answer-book. **Writing Name, Seat No., Phone/Cell No., putting signature, use of religious invocation or any writing that is not relevant to the answers anywhere in the answer-book will be treated as attempts to reveal identity.**
20. Underlining of answers for focusing attention is permitted. However, use of varied inks, except for illustrations and figures must be avoided. DO NOT use symbol like encircling the question or using colour arrows for P.T.O. These will all be considered as attempt to readily identify the specific answer-book & will be treated as unfair means.

IT IS PRESUMED THAT CANDIDATE HAS READ ALL THE ABOVE INSTRUCTIONS.

Space for Marks	Question No.	START WRITING HERE

Q.I a) Any 2.

b) There are 4 types of Analyses:-

1) Qualitative Analysis.
2) Quantitative Analysis.
3) Characterization Analysis.
4) Fundamental Analysis.

1) Qualitative Analysis deals with the constituent particle of a substance. The analyte present in the sample is to be detected. In Analytical chemistry, it is considered as a problem solving analysis. Presence of drug-enhancing properties present in the body of athlete can be detected by Urine sample. Air-borne particulate matter tells us about the presence of Pb in the ~~soil~~ surrounding.

2) Quantitative Analysis deals with the numerical term the amount of substance and concentration of solution. In classical methods, the process such as crystallization filteration, precipitation to find out the the organic or inorganic substance present in the sample. Now, instrumental methods are used such as Mass spectrometry, Nuclear Magnetic Resonance; etc to detect the amount of ~~the~~ desired substance present in the solution.

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3) Characterization Analysis characterizes chemical and physical properties of a substance with the help of instruments. The properties such as dielectric constant, molar conductance, absorption, emission, photochemical energy, thermal energy, etc are characterized and new method is generated to analyse the same by quantitative analysis. The qualitative, quantitative, & characterisation analysis comes under fundamental analysis.

4) Fundamental analysis deals with various methods and studies them and uses them to analyse the substance by operating them through standard operating procedures. Instruments used for any analysis should be operated at standard terms and regulations provided by Accreditation department or Quality check department.

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	d)	Method validation is the process used to validate the method for a particular analysis of substance for a desired set of reaction. A unique method is used for the analysis of the component of interest that is the analyte from the matrix that is the remainding part other than analyte. The standard Operating procedures given by the ~~ECH~~ EPA guidelines (Environmental Protection Agency) are to be followed, because they are the guidelines which are followed world wide and it gives better efficacy & trust from the people who have already used them. Thus, they are validated and certified for better improvement of the environment. The istruments used for these purpose are highly accrediated and certified as instruments which give hundred percent accuracy and negligible or less effect on the environment through the effect of chemicals

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	B)g)

Precision is defined as the limit of agreement between the ~~true~~ values ~~and~~ taken by making a reaction ~~it~~ go through the same procedure keeping the conditions of the reaction constant and repeating them until you get of set of values.

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Q5) Any 2.

a) Charge transfer absorption,

There are 4 types of transition that occur when an energy is given to the compound present in the substance There are bonding orbitals (σ), non-bonding orbitals (n) and anti-bonding orbitals (π^*).

If there are compounds containing atoms or functional groups such as OH, N_2, etc having lone pairs and if the compound has more conjugation then the energy required for transition from low energy level to high energy level is less. As a result, the wavelength used for absorption of light for U.V-visible Spectroscopy is more.

$\sigma - \sigma^*$ interaction,

This interaction requires high energy because the transition of electron takes place from lowermost energy level (σ) to the an uppermost antibonding level of σ^*. The wavelength required for absorption of light is the range of 100 nm to 200 nm.

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$n - \pi^*$ interaction,
This interaction for transfer of electron requires less energy because the energy levels are near to each other and the bonding orbital have so filled energy levels due to the presence of lone pair. Its wavelength ranges in the wavelength of visible spectroscopy that is between 200nm to 700nm.

$\pi - \pi^*$ and $n - \pi^*$ interaction,
π is the energy level where the electrons occupy the bonding orbital. where as n is the non-bonding orbital which is left empty because here minimum or less electrons are placed.
π^* is activated or anti-bonding orbital which requires high energy for transmission of an electron.

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d) Factors affecting absorption of UV-visible spectroscopy:

1) Effect of pH.

pH is to be maintained of the solution because as the pH concentration increases the degree of absorbance at high concentration decreases, this can be well explained by Beer-Lamberts law graph which is a plot between Absorbance (A) V/S wavelength (λ). when the conc. is low it shows linearity that is as wavelength increases absorbance increases at one point of time it shows non-linearity because of high concentration, because when the pH is increased there are possible chances of substrate or foreign material being added.

2) Effect of Temperature.

The effect of temperature has various means of effect on absorption. They are directly proportional to each other.

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3) Effect of solvent.
The absorbance factor plays an important role in UV-visible spectroscopy. The sample to be analysed should be diluted and prepared with great accuracy without any impurity, because when it is poured in transparent cuvette the transmitted light detects minutely and the light is absorbed by the solvent and the rest of light is reflected. Hence, solvent purity more we get highest absorptivity.

4) Effect of substituent.
Chromophore is the substance which is added to increase the substituents efficiency to absorb more light transmitted. If the functional group has lone pairs it dissociates electrons & making it easier to absorb more light thermally. Auxochrome is a colour imparting material added to increase the absorptivity.

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b) b) Theory.

Infrared spectroscopy absorbs wavelength in the 200-700 nm range, where its source is heated at a very high temperature The range which is in between the visible and UV-visible wavelength range. A very high temperature resistant material called as source is used which activates the electrons ~~pie~~ or particles from the solution which is then passed through the transducer with the help of thermocouple junction and the electrons which are generated, are detected by a detector. The movement of electron through this instrument generates an electrical circuit type of diagram which generates electricity.

Application.

1) Detection of structure.
2) Identification of Molecules.
3) No two molecules can have same or exact fingerprinting. So, there is always a unique wavelength for any particle, atom or functional group.
4) Functional Group Detection.

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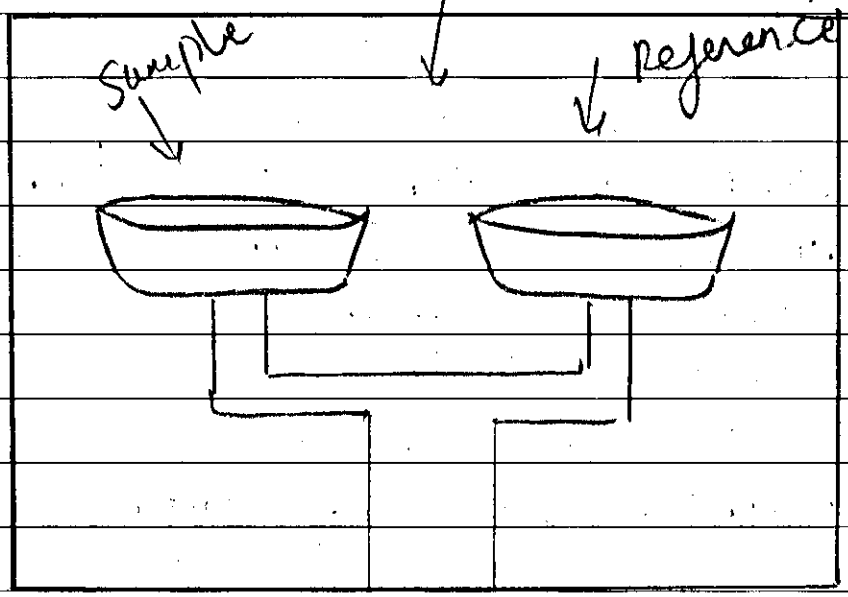
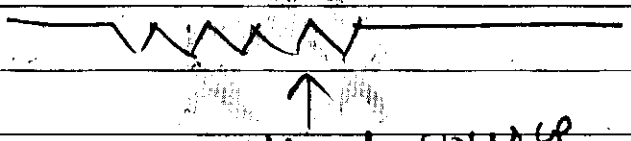
(Q4) Any 2.

a)





Heat flux DSC cell.

This process takes place in an evacuated chamber so that no heat is exchanged with the surrounding. The process is an adiabatic process. Heat is generated uniformly throughout the procedure. In two pans, sample and known substances are kept, and they are uniformly heated. ~~The~~ ~~dono~~ With the help of values added in the known concentration of substance, the difference between the known

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and sample can be calculated. The amount of loss of substance can be detected.

c)

TGA	DTG
① Thermal gravimetric Analysis, the sample and reference are heated simultaneously.	① Differential Thermal gravimetric Analysis, the sample is first heated separately.
② The difference between the known and sample indicates us the amount of substance heated off in the sample.	② The differential analysis is done.
③ Thermal Methods are measured by thermobalance instrument-	③ Differential Scanning colorimetry is used.

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Q5.) Any 4.

a) Method.

A technique used to follow the steps to get a desired product without any hindrance or wasting the chemicals.

Procedure

A standard procedure which when followed gives the exact desired product. In Procedure, the chemical as well as physical properties required to carry out the experiment are stated.

The procedure are widely used by various pharmaceutical industries because they are validated and proved correct by ~~Quality~~ ~~Co~~ American authorities.

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	b)	The Qualitative and Quantitative analysis are the factors which ~~play~~ are to be considered because they tell us about the amount of analyte and conc. of analyte respectively present in a suitable ~~to~~ experiment. The instruments used should be checked regularly and should follow standardisation. ~~of~~ The method ~~used~~ followed should be validated and come under SOPs (Standard operating Procedures). The chemical and physical properties detected should be easily calculated. Various methods are to be carried out for highest efficiency of the ~~to expect~~ experiment followed.

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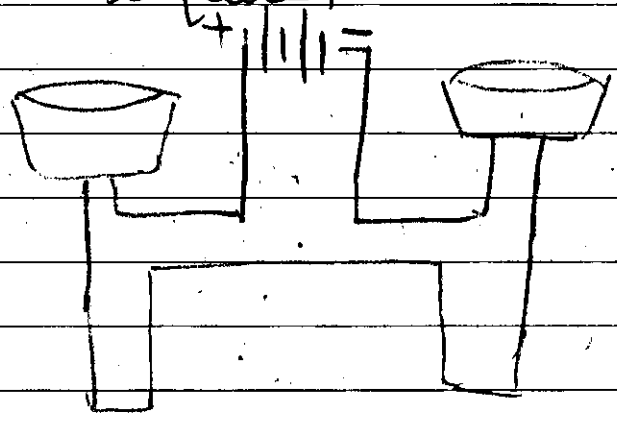
	h)

Power Compensated DSC cell.

Power is the source used, to heat the sample and reference substances. Here, closed system is not required.



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Any-2.

Q2] Na conc is reported as 50meq/lit.
Conc. in mg/dL = ?
= mg/100ml.

50meq/lit ≡ 50×10^{-3} mg/1000cm³.

~~1M = 1000 ≡ 23.~~

~~50 x = 1000 ≡ 50x10⁻³~~

~~? ≡ 5mg/100ml.~~

~~1M ≡ 1000 ml ≡ 23.~~

~~? ≡ 100 ≡~~

~~M ≡~~

b) KMnO4

Molecular weight of KMnO4 = 39 + 52 + 16x4
= 155 g/lit.

0.1N = ?.

$KMnO_4 \rightleftharpoons K^+ + MnO_4^{2-} + 2e^{\ominus}$

Normality = Given wt / eq.wt

Molar Conductance → Molecular weight

1N ≡ 1000 ≡ Mol.wt (155) ÷ 2 = 77.5.

0.1N ≡ 500 ≡ ~~155~~ x.

equivalent weight ← Conductance

$x = \frac{500 \times 0.1 \times 155}{1000} = 7.75$

x = 3.875g.

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b)

Laboratory safety guidelines.

1) One should make proper use of PPE (Personal Protection Equipment) such as Gloves, masks, Goggles, coat, ear plugs, etc.
2) While handling chemicals we should be very much attentive.
3) Proper ~~th~~ clothing and footwear should be worn.
4) Before, starting with the experiment we should read the procedure carefully.
5) NOT to drink or eat anything in the library.
6) Glass wares should be handled carefully.
7) Hair should be tighed on top.
8) Complete attention is required, noting the readings and handling the instruments with care.

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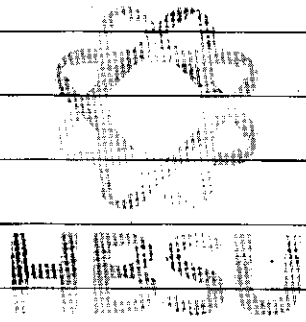

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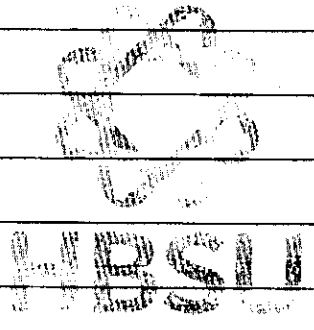

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Re-Evaluator Sheet

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Exam Date :.....

Program Code & Name :.....

Subject Code & Name :.....

Year / Semester :.....

Questionwise Marks given by Re-Evaluator

Q. No.	Marks	Q. No.	Marks
1		6	
2		7	
3		8	
4		9	
5		10	
		Total	

Name & Signature of Re-Evaluator with Date